HSK-320Z User's Manual

Revision

1.0	Initial draft
1.1	Change the association groups.
1.2	Add dimmer mode
1.3	Add sensor binding commands.

Introduction

The HSK-320Z is a multi function I/O module of Z-Wave. It can be connected to relay board to control up to four ports, or be connected to sensor to trigger Z-Wave command to a group of devices. The HSK-320Z also features motor control to control curtain or roller blinds.

In addition, the HSK-320Z can be used as Z-wave to RS-485 bridge. The 4 output ports and Z-Wave group can be controlled by RS-485 command.

Connection

There are 4 I/O ports on HSK-320Z. The 4th port is shared with RS-485 function. If RS-485 is enabled, the 4th port is disabled automatically.

The 4 I/O ports can be configured as input or output together. If the HSK-320Z is configured as input mode, only input ports are functional, please remove all connector from output ports. If HSK-320Z is in output mode, only output ports are functional, please remove all connector from input ports.

Each input port accept input level from 0v to 3.3v. The input port is non-isolated, please be careful of the input voltage. If the input port is opened(non-connected), it is normally in "high" status (pulled-high to 3.3v). If the input port is connected to ground, it is in "low" status.

Each output port is isolated solid state relay output. Maximum current of relay is 500mA, maximum voltage of relay is 48v.

Z-Wave Network

The HSK-320Z is a Z-Wave slave device. To include or exclude HSK-320Z to a Z-Wave network, please click the program button beside DC power jack.

Device Mode Configuration

The HSK-320Z support 4 modes:

Table 1: All device modes of HSK-320Z

Mode	Type	Display	Description
1	Input mode	LED 1 light	All 4 ports are in input mode. Any change of input status will trigger Z-Wave command sending to group.
2	Output mode	LED 2 light	All 4 ports are in output mode. Use Z-Wave command to control each port. This mode will handle the BASIC_SET/BASIC_REPORT/ SENSOR_BINARY_REPORT as well.
3	Motor pulse mode	LED 3 light	All 4 ports are in output mode. Port 1,2,3 sends pulse to control motor up,stop,down.
4	Motor hold mode	LED 4 light	All 4 ports are in output mode. Port 1 and 3 hold it's status to control motor up and down.
5	Dimmer mode	LED 1 blink	For 1-10v dimmer module. In this mode, we will send RS-485 dimmer command when any of the four input channel are connected.
6	RS-485 bridge mode	LED 2 blink	Send RS-485 packet by Z-Wave command.

To configure mode of HSK-320Z:

1. Push program button before plug power, hold button until LED is on (about 1 sec.).
2. Release program button, then LEDs turn on alternated. Push the button again when desired LED(device mode) is lighting or blinking. See table 1 to select a desired mode.
3. If selected mode is 3 or 4, you can run motor calibration now, see the "Motor Calibration" section. If you don't want to run calibration, please unplug power and plug it again.

Input Mode

The HSK-320Z can be an input extender of HSC-45. To do this, associate HSC-45 to group 1 of HSK-320Z.

The HSK-320Z also can be a 4-port sensor device. If any of the 4 input ports is changed, it will send Z-Wave command to devices in related group. The HSK-320Z support 3 types of Z-Wave command: BASIC_SET, SENSOR_BINARY_REPORT, and SCENE_ACTIVATION_SET. Please see the chapter "Z-Wave Association Group" for the detail.

Output Mode

When the HSK-320Z is in output mode, it support various Z-Wave command to turn on/off the

four output port.

- BASIC_SET or SENSOR_BINARY_REPORT:
  Devices associated with group 2 to 5 can control port 1 to 4. Value 0 turns off port, non-zero value turns on port. If device is not associated with any group, the value of BASIC_SET will be regarded as bitmap value of all four ports.

- SCENE_ACTIVATION_SET command:
  Scene ID 1 turns on port 1, ID 2 turns off port 1. Scene ID 2 turns on port 2, ID 3 turns off port 2, and so on port 3,4.

Table 2: Scene ID of SCENE_ACTIVATION_SET

Scene ID	Function
1	Turn on port 1
2	Turn off port 1
3	Turn on port 2
4	Turn off port 2
5	Turn on port 3
6	Turn off port 3
7	Turn on port 4
8	Turn off port 4

Dimmer mode

Under the dimmer mode, the input pin of the HSK-320Z can be used to send RS-485 commands to control the 1-10v dimmer module.

The (poort,dev) is fixed to

Port	Dev	IO
0	0x66	1
1	0x66	2
2	0x66	3

3	0x66	4
4	0x66	5
5	0x66	6
6	0x66	7
7	0x66	8

For example, when we press the IO1, the dimmer value will be changed until we release the line. The (0,0x66,v) will be sent every 100ms. The current value will not be saved into the NVRAM so that it will become 0 after the power of HSK-320Z is reset.

In addition, the HSK-320Z will receive the multi channel BASIC command which will be translated into RS-485 commands. The instance 1 is mapped to IO1 and so on.

Motor Mode

When HSK-320Z is in motor mode, the output port can be connect to the interface of motor controller. The HSK-320Z support three control command: up, down, and stop. Port 1 is for “up” control, port 2 is for “stop” control, port 3 is for “down” control.

Table 3: Output port function under motor mode

Port	Function
1	Up
2	Stop
3	Down
4	please keep it unconnected

Z-Wave command class COMMAND_CLASS_SWITCH_MULTILEVEL can be used to control motor when HSK-320Z is in motor mode. To control motor manually, please use SWITCH_MULTILEVEL_START_LEVEL_CHANGE and SWITCH_MULTILEVEL_STOP_LEVEL_CHANGE. Use BASIC_SET with desired level can set motor position if calibration is run correctly, see the “Motor Calibration” section.

There are two type of motor mode supported: pulse mode and hold mode. Pulse mode turn on related output port only a short period when execute up/down/stop command, most motor controller support this mode. Hold mode keeps the related output port turned on when execute up/down command, and turns off output port when execute stop command.

Motor Calibration

To calibrate motor control, follow the steps:

1. Push program button before plug power, hold button until LED is on (about 1 sec.).
2. LEDs turn on alternated, push the button again when LED 3(pulse mode) or LED 4(hold mode) is on.
3. Push the button again, motor will go up.
4. When motor go to top, push the button again, then motor goes down.
5. When motor go to bottom, push the button again, then motor stops. The duration between top and bottom will be record on configuration parameter 2.

Z-Wave Association Group

The HSK-320Z support 13 groups. Input port state change can trigger some Z-Wave command sending to all devices in a related group. See the following table.

Table 4: Z-Wave Association group of HSK-320Z

Group	Description
1	In input mode: If any of the 4 ports change it's state, the current input state of all 4 ports is represented in bitmap format and send to all devices in group 1 by BASIC_SET. Bit 0 is state of port 1, bit 3 is state of port 4.
2-5	In input mode: If any of port 1 to 4 is changed, BASIC_SET with be sent to all devices in related group. The value of BASIC_SET will be 255 if input port is changed from "high" to "low", or the value will be 0 if input port is changed from "low" to "high". In the output mode: We will turn on/off port 1-4 when we receive any BASIC_SET/ BASIC_REPORT/SENSOR_BINARY_REPORT from any nodes listed in these groups.
6-9	In input mode, group 6-9 is similar to group 2 to 5, but it will send SENSOR_BINARY_REPORT instead of BASIC_SET.
10-13	In input mode, if any of port 1 to 4 is changed from "high" to "low", SCENE_ACTIVATION_SET with port number(1 to 4) will be sent to all devices in related group.

Z-Wave Configuration

Table 5: Z-Wave Configuration parameters of HSK-320Z

No.	Parameter	Value Range	Description
1	Device Mode	default:1 valid:1 to 6	Device mode: 1: Input mode 2: Output mode 3: Motor mode #1 (pulse) 4: Motor mode #2 (hold) 5: 6:
2	Run Duration	default:600 valid: 10-6000	Motor progress duration (unit in 0.1 sec.). Valid value: 10-6000 (1 sec. to 600 sec.) . Default value: 600 (60 sec.)
3	Pulse On Duration	default: 30 valid: 1-255	On duration of the pulse under motor mode #1. (unit in 10ms) Valid value: 1-255 (10ms to 2.5sec.) Default value: 30 (300 ms)
4	Pulse Off Duration	default: 30 valid: 1-255	Off duration of the pulse under motor mode #1. (unit in 10ms) Valid value: 1-255 (10ms to 2.5sec.) Default value: 30 (300 ms)
5	Hold Rest Duration	default: 30 valid: 1-255	Rest duration of two contiguous action under motor mode #2. (unit in 10ms) Valid value: 1-255 (10ms to 2.5sec.) Default value: 30 (300 ms)
6	Stop Before Reverse	default:1 valid:0,1	For Motor mode #1 only. 1: If the desire action is reversed from current action, the HSK-320Z will stop the motor automatically before reversed action. 0: Desired action will be executed immediately.
7	Stop Type	default:0 valid:0,1,2	For Motor mode #1 only. 0: Use IO2 to stop motor. 1: IO2 is disabled. A reversed action is taken to stop motor controller. 2: IO2 is disabled. A toggle action is taken to stop motor controller.

8	Auto Stop	default: 0 valid: 0,1	For Motor mode #1,#2 only. 1: HSK-320Z will stop the motor according to the "Run Duration" automatically when motor reach top/bottom. 0. No auto stop.
9	Switch All	default:0 valid: 0,1,2,255	For Motor mode #1,#2 only. 0: exclude on/off 1: exclude only on 2: exclude only off 255: enable on/off
10	UART Mode	default 0: valid: 0,1	0: RS-485 is disabled. The IO port 4 is available. 1: RS-485 is enabled. The IO port 4 is unavailable.
11	UART Baud	default: 96 valid: 38,96,115	96: RS-485 baud rate is 9600 BPS 38: RS-485 baud rate is 38400 BPS 115: RS-485 baud rate is 115200 BPS
12	RS-485 ID	default: 0 valid: 0-255	For Input Mode only. ID of RS-485. If ID is 0, the HSK-320Z ignores ID of RS-485 commands (accept all command).
13	Inverse Output	default: 0 valid: 0, 1	For output mode only. 0: Output port is NO (normally open). 1. Output port is NC (normally closed).
14	Inverse Input	default: 0 valid: 0, 1	For input mode only. 0: Input port is low active. 1. Input port is high active.
15	RS-485 Map Type		For RS-485 bridge mode.
16	Dim curve threshold 1	default: 33	
17	Dim curve threshold 2	default: 66	
18	Dim step 1	default: 1	
19	Dim step 2	default: 1	
20	Dim step 3	default: 1	

Factory Reset

To reset the HSK-320Z to factory default:

1. Push program button before plug power, hold button until LED is on.

2. Keep the program button pressed, the LED will turn off after 5 sec.
3. Release the program button.

RS-485 Command

When UART mode of configuration is set to 1, the HSK-320Z can be controlled via RS-485 bus. RS-485 command can simulate input port high/low event to send Z-Wave command to devices in a group. RS-485 command also can control 4 output ports in output mode, or control motor up/down/stop in motor mode.

The RS-485 command is 9 bytes:

C0	id	len	type	rep	port	dev	val	C1

C0: Leading byte, must be hex value C0.
C1: Ending byte, must be hex value C1.
id: RS-485 ID, must conform with Z-Wave configuration parameter 12.
len: Length of packet. Must be 9.
type: Must be 45.
rep: Must be 0.
port: Must be 0.
dev: 1 to 5 for Z-Wave command. E1 to E4 for I/O port. See the following table.
val: Command value. See the following table.

Table 6: RS-485 command parameter

dev	val	function
1-5	0-99,255	Z-Wave command: BASIC_SET with command value to group 1-5.
1-5	128	Z-Wave command: SWITCH_MULTILEVEL_START_LEVEL_CHANGE with “up” direction.
1-5	129	Z-Wave command: SWITCH_MULTILEVEL_START_LEVEL_CHANGE with “down” direction.
1-5	130	Z-Wave command: SWITCH_MULTILEVEL_STOP_LEVEL_CHANGE.
e1-e4	0	Turn off output port 1-4 (local output port)
e1-e4	1-99,255	Turn on output port 1-4 (local output port)
e1	128	Motor Up (local output port)
e1	129	Motor Down (local output port)

e1	130	Motor Stop (local output port)